REMARKS

By this amendment, applicants have amended the title to be more descriptive, as required by the Examiner, and have amended the abstract to be in proper format. Applicants have also amended the claims to more clearly define their invention. In particular, the claims have been amended to eliminate the language deemed indefinite by the Examiner. Claim 1 has also been amended to indicate that the projection portion of the valve has a tapered surface, only a portion of which, in a closed position, is in contact with the tapered surface of the valve seat portion to form a line contact between the valve and the valve seat portion. See, e.g., page 11, lines 26 - 32 of applicants' specification. Claims 2 and 3 have been amended to depend from claim 1. Claim 4 has been amended to clarify the location of the bore and retainer. See, e.g., Figures 2 and 3 and the description thereof in applicants' specification. Claims 5 - 8 have been amended to depend from claim 4. Claim 12 has been cancelled and claims 13 - 17 added to define further aspects of the present invention. See, e.g., Figure 4 and the paragraph bridging pages 13 and 14 of applicants' specification.

The Examiner has objected to the drawings as allegedly not identifying a reference numeral for the "flat surface portion" recited in, e.g., claim 2. However, it is noted Figures 8(a) and 8(b) identify the flat surface portion with reference numeral 17b. See, e.g., page 16, lines 20 - 26 of applicants' specification. Accordingly, reconsideration and withdrawal of the objection to the drawings are requested.

In view of the foregoing amendments to the title and abstract, reconsideration and withdrawal of the objections to the title and abstract are requested.

Noting the Examiner's comments concerning the phrase "curved surface" applicants have amended the claims to eliminate this phrase.

In view of the foregoing amendments to the claims, it is submitted all of the claims now in the application comply with the requirements of 35 USC 112, second paragraph. Accordingly, reconsideration and withdrawal of the rejection of claims 1 - 12 under 35 USC 112, second paragraph, are requested.

Claims 1 - 12 stand rejected under 35 USC 102(b) as allegedly being anticipated by United States Patent No. 4,329,125 to Chambers. Applicants traverse this rejection and request reconsideration thereof.

The present invention relates to a compressor including a compression chamber for compressing working fluid therein, a discharge port through which the working fluid flows out from the compression chamber, and a valve for opening or closing the discharge port. According to one aspect of the present invention, as set forth in amended claim 1 and as shown, by way of example only in Figure 4, the valve has a valve seat portion 18 provided around the discharge port and having tapered surfaces so that a cross-sectional area of the discharge port increases in a direction away from the compression chamber 21. A valve 17 having a projection portion with a tapered surface is provided so that, in a closed position, only a portion of the tapered surface is in contact with the tapered surface of the valve seat portion 18 so that a line contact between the valve 17 and the valve seat portion 18 is formed. A retainer 20 positions the valve 17 on the valve seat portion 18.

As set forth in amended claim 4 and as shown by way of example only in Figure 4, the valve 17 has a projection portion having a tapered surface, at least a portion of which, a closed position, is in contact with a tapered surface of the valve seat portion 18. A bore 6a is provided in the end plate 6 which blocks an opening of the cylinder 4 (see figure 1). The retainer 20 is inserted into the bore 6a for holding the valve 17 opposed to the valve seat portion 18. As more specifically set forth in

dependent claims 13, 14, 16 and 17, and as shown, by way of example only, in Figure 4, the tapered surface of the projection portion of the valve 17 has a conical portion (section b-c) at the end closest to the compression chamber 21 and a spherical portion (section a-b) adjacent to the conical portion. In the closed position, as shown in Figure 4, a portion 17a of the spherical portion contacts a portion of the tapered surface 18 of the valve seat portion to form the line contact between the valve 17 and the valve seat portion 18.

The patent to Chambers discloses a discharge valve assembly for compressor utilizing a disk-like pressure responsive discharge valve. The assembly includes hardened seats on the valve and the cylinder head, a compression spring disposed therebetween urging the valve in a closing direction, and a spring guide surrounding the spring and providing a continuous annular stop surface for limiting opening movement of the valve, whereby wear is reduced and valve lift controlled. In an alternative embodiment, the assembly operates between the valve and a bridge member rather than a cylinder head. However, in Chambers, it appears that all of the tapered surface of the valve 35/135 is, in the closed position, in contact with the tapered surface of the valve seat. In contrast, as set forth in independent claim 1 and the claims dependent thereon, only a portion of the tapered surface of the valve of the present invention is, in a closed position, in contact with the tapered surface of the valve seat portion to form a line contact between the valve and the valve seat portion. Such is neither disclosed nor suggested by Chambers.

Moreover, as set forth in independent claim 4 and the claims dependent thereon, a bore is provided in the end plate which blocks the opening of the cylinder, and the retainer for the valve is inserted into the bore. Such is neither disclosed nor suggested by Chambers.

Accordingly, the Chambers patent does not anticipate the presently claimed invention.

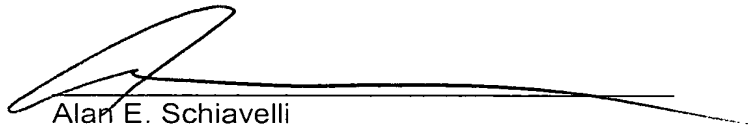
Applicants note the Examiner has cited a number of additional documents. However, since these documents were not applied in rejecting claims formerly in the application, further discussion of these documents is deemed unnecessary.

In view of the foregoing amendments and remarks, favorable reconsideration and allowance of all of the claims now in the application are requested.

To the extent necessary, applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees, to the deposit account of Antonelli, Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (Case: 520.40206X00), and please credit any excess fees to such deposit account.

Respectfully submitted,

ANTONELLI, TERRY, STOUT & KRAUS, LLP



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VERSION WITH MARKINGS TO SHOW CHANGES

IN THE TITLE:

A COMPRESSOR INCLUDING TAPERED DISCHARGE VALVE AND VALVE SEAT

IN THE CLAIMS:

1. (Amended) A compressor, comprising:

a compression chamber for compressing working fluid within an inside thereof;

a discharge port, through which ~~said~~ the working fluid flows out from ~~said~~ the compression chamber;

~~a valve means for opening or closing said discharge port;~~

a valve seat portion ~~being~~ provided ~~in said~~ around the discharge port and having ~~a shape of curved~~ tapered surfaces, so that a ~~cross-section~~ cross-sectional area of ~~said~~ the discharge port ~~comes to be large from a side of~~ increases in a direction away the compression chamber;

a valve having a projection portion having a ~~curved~~ tapered surface, only a portion of which, in a closed position, is in contact with ~~said curved~~ tapered surface of the valve seat portion to form a line contact between the valve and the valve seat portion; and

a ~~means being provided on a member formed in one body with said valve seat portion,~~ retainer for positioning ~~said~~ the valve ~~to said~~ on the valve seat portion.

2. (Amended) A compressor~~, comprising:~~

~~a compression chamber for compressing working fluid within an inside thereof;~~

~~a discharge port, through which said working fluid flows out from said compression chamber;~~

~~a valve means for opening or closing said discharge port;~~

~~a valve seat portion being provided in said discharge port and having a shape of curved surfaces, so that a cross-section area of said discharge port comes to be large from a side of the compression chamber;~~

~~a valve having a projection portion having a curved surface in contact with said curved surface of the valve seat portion;~~

~~a means being provided on a member formed in one body with said valve seat portion, for positioning said valve to said valve seat portion; and~~ as defined in claim 1, wherein the valve has

a flat surface portion ~~being~~ provided at an end portion of ~~said~~ the valve on the side of the compression chamber.

3. (Amended) A compressor~~, comprising:~~

~~a compression chamber for compressing working fluid within an inside thereof;~~

~~a discharge port, through which said working fluid flows out from said compression chamber;~~

~~a valve means for opening or closing said discharge port;~~

~~a valve seat portion being provided in said discharge port and having a shape of curved surfaces, so that a cross-section area of said discharge port comes to be large from a side of the compression chamber;~~

~~a valve having a projection portion having a curved surface in contact with said~~

~~curved surface of the valve seat portion;~~

~~a means being provided on a member formed in one body with said valve seat portion, for positioning said valve to said valve seat portion; and~~

as defined in claim 1, wherein the discharge port has a cylindrical portion~~,~~ ~~being formed by connecting an inner side surface of said discharge port with said~~provided between the compression chamber and the valve seat portion~~,~~ ~~continuously~~.

4. (Amended) A compressor, comprising:

a compression chamber including a cylinder and a piston for compressing working fluid ~~within an inside thereof~~ therebetween;

an end plate for blocking an opening of the cylinder, the end plate including a discharge port provided therethrough, through which ~~said~~ the working fluid flows out from ~~said~~ the compression chamber;

~~a valve means for opening or closing said discharge port;~~

a valve seat portion ~~being~~ provided ~~in said~~ around the discharge port and having ~~a shape of curved~~ tapered surfaces, so that a ~~cross-section~~ cross-sectional area of ~~said~~ the discharge port ~~comes to be large from a side of~~ increases in a direction away from the compression chamber;

a valve having a projection portion having a ~~curved~~ tapered surface, at least a portion of which, in a closed portion is in contact with ~~said curved~~ the tapered surface of the valve seat portion;

a bore ~~being~~ provided ~~on a member formed in one body with said valve seat portion, and connecting~~ the end plate, the bore being connected to ~~said~~ the valve seat portion; and

a ~~holding means being~~ retainer inserted into ~~an inside of said~~ the bore ~~to be~~

~~positioned,~~ for holding ~~said~~ the valve opposing to ~~said~~ the valve seat portion.

5. (Amended) A compressor~~, comprising:~~

~~a compression chamber for compressing working fluid within an inside thereof;~~

~~a discharge port, through which said working fluid flows out from said compression chamber;~~

~~a valve means for opening or closing said discharge port;~~

~~a valve seat portion being provided in said discharge port and having a shape of curved surfaces, so that a cross-section area of said discharge port comes to be large from a side of the compression chamber;~~

~~a valve having a projection portion having a curved surface in contact with said curved surface of the valve seat portion; and~~

~~a bore being provided on a member formed in one body with said valve seat portion, and connecting to said valve seat portion;~~

~~a holding means being inserted into an inside of said bore to be positioned, for holding said valve opposing to said valve seat; and~~

as defined in claim 4, wherein the valve has a flat surface portion ~~being~~ provided at an end portion of ~~said~~ the valve on the side of the compression chamber.

6. (Amended) A compressor~~, comprising:~~

~~a compression chamber for compressing working fluid within an inside thereof;~~

~~a discharge port, through which said working fluid flows out from said compression chamber;~~

~~a valve means for opening or closing said discharge port;~~

~~a valve seat portion being provided in said discharge port and having a shape~~

~~of curved surfaces, so that a cross-section area of said discharge port comes to be large from a side of the compression chamber;~~

~~a valve having a projection portion having a curved surface in contact with said curved surface of the valve seat portion; and~~

~~a bore being provided on a member formed in one body with said valve seat portion, and connecting to said valve seat portion;~~

~~a holding means being inserted into an inside of said bore to be positioned, for holding said valve opposing to said valve seat portion; and~~ as defined in claim 4, wherein the retainer through which the working fluid is discharged includes

an opening ~~provided on said holding means~~.

7. (Amended) A compressor~~, comprising:~~

~~a compression chamber for compressing working fluid within an inside thereof;~~

~~a discharge port, through which said working fluid flows out from said compression chamber;~~

~~a valve means for opening or closing said discharge port;~~

~~a valve seat portion being provided in said discharge port and having a shape of curved surfaces, so that a cross-section area of said discharge port comes to be large from a side of the compression chamber;~~

~~a valve having a projection portion having a curved surface in contact with said curved surface of the valve seat portion; and~~

~~a bore being provided on a member formed in one body with said valve seat portion, and connecting to said valve seat portion;~~

~~a holding means being inserted into an inside of said bore to be positioned, for holding said valve opposing to said valve seat portion; and~~

as defined in claim 4, wherein the discharge port has a cylindrical portion~~, being formed by connecting an inner side surface of said~~provided between the compression chamber and the discharge port with said valve seat portion~~, continuously~~.

8. (Amended) A compressor~~, comprising:~~

~~a compression chamber for compressing working fluid within an inside thereof;~~

~~a discharge port, through which said working fluid flows out from said compression chamber;~~

~~a valve means for opening or closing said discharge port;~~

~~a valve seat portion being provided in said discharge port and having a shape of curved surfaces, so that a cross-section area of said discharge port comes to be large from a side of the compression chamber;~~

~~a valve having a projection portion having a curved surface in contact with said curved surface of the valve seat portion; and~~

~~a bore being provided on a member formed in one body with said valve seat portion, and connecting to said valve seat portion;~~

~~a holding means being inserted into an inside of said bore to be positioned, for holding said valve opposing to said valve seat portion; and~~

as defined in claim 4, further comprising a passage ~~being~~ provided between ~~said holding member~~ the retainer and an inner side surface of ~~said~~ the bore for conducting the working fluid therethrough.

9. (Amended) A compressor, as defined in any one of the claims 1 to 8, further comprising:

a biasing means for supporting ~~said~~ the valve, so that ~~said~~ the valve is ~~freely~~ biased towards the closed position in contact ~~on or separate from a sheet~~ with the tapered surface of said valve seat portion but can be forced out of contact with the

tapered surface of the valve seat portion by pressure within the compression chamber.

10. (Amended) A compressor, as defined in ~~any one of the claims 1 to 8, further comprising:~~

~~a~~ claim 9, wherein biasing means ~~for supporting said valve, so that said valve is freely contact on or separate from a sheet surface of said valve seat portion, and having~~ is a coiled spring ~~being~~ engaged with ~~said~~ the valve ~~and~~, the coiled spring being formed nearly into a conical shape.

11. (Amended) A compressor, as defined in ~~any one of the claims 1 to 8, further comprising:~~

~~a~~ claim 9, wherein the biasing means ~~for supporting said valve, so that said valve is freely contact on or separate from a sheet surface of said valve seat portion, and having~~ is a leaf spring ~~being~~ formed with slits ~~and~~ for biasing ~~said~~ the valve with a central portion thereof.

IN THE ABSTRACT:

A compressor~~, comprising:~~ includes a compression chamber for compressing working fluid within an inside thereof~~;~~, a discharge port, through which the working fluid flows out from the compression chamber~~;~~, and a discharge valve ~~means~~ for opening or closing the discharge port~~;~~. The discharge valve includes a valve seat portion ~~being~~ provided in the discharge port and having a shape of curved surfaces, so that a cross-section area of the discharge port comes to be large from a side of the compression chamber~~;~~. The ~~a~~ valve ~~having~~ has a projection portion having a curved surface in contact with the curved surface of the valve seat portion~~; and a means being~~. A spring is provided on a member formed in one body with the valve seat portion, for positioning the valve to the valve seat portion, wherein clearance volume of the discharge port is

reduced, so as to improve the performances thereof.